

RIB FOR A WALL CONSTRUCTION

1

2

3 The present invention relates to a structural
4 component or rib and to an insulated wall assembly
5 formed using the structural rib.

6

7 There are requirements under building regulations in
8 the United Kingdom and elsewhere to provide a
9 certain standard of insulation for all building
10 structures. In wall construction this is presently
11 achieved by inserting various insulating materials
12 into cavities in the wall structure and various
13 methods of insulating these cavities have developed
14 over the years. More recently, in order to increase
15 the volume of the cavity available for insulation,
16 framed construction of timber or steel has been
17 employed. Framed construction is structural and has
18 the advantage of lending itself to prefabrication.

19

1 In all cases, the amount of insulation insertable
2 into the cavity is limited by the size of the
3 cavity, e.g. the distance between the internal leaf
4 and external leaf forming a masonry cavity wall.
5 However, in this case the size of the cavity is
6 limited by structural considerations. To place the
7 internal leaf and external leaf too far apart would
8 create a structurally unsound wall which may
9 collapse over time. To offset this and to maximise
10 the size of cavity available for insulation, wall
11 ties are employed to create anchoring points
12 connecting the inner leaf and outer leaf together,
13 thus lending structural stability to the wall.
14 Demands for greater insulation will necessitate the
15 use of longer wall ties but their length will be
16 constrained by the ability of the wall to act as a
17 structural composite and remain stable. In short, a
18 balance must be struck between the size of the
19 cavity and the minimum insulation which is necessary
20 to insulate the building structure. However, the
21 thickness of insulation required to meet the
22 regulations in the future may result in the demise
23 of the masonry cavity wall as a form of load bearing
24 construction.

25

26 Framed construction is an attractive alternative as
27 it offers speed of erection, prefabrication off
28 site, and is less dependant on traditional skills
29 and materials. While offering extensive cavities
30 for insulating it is not complete in itself and
31 requires the application of weatherproof cladding
32 and an internal lining.

1 As building standards and environmental regulations
2 become more stringent, greater amounts of insulation
3 and better insulation methods will be required.
4 Consideration has also to be given to the
5 positioning of the insulation in the wall
6 construction to avoid the risk of harmful
7 condensation forming.

8
9 More recent methods of insulating cavity walls
10 provide for a partial fill of the cavity with
11 insulation, such that a portion of the cavity still
12 remains between the outer face of the insulation and
13 the inner face of the external leaf of the cavity
14 wall. This is done in order to prevent cold
15 bridging between the outer leaf and inner leaf of
16 the cavity wall and to prevent the ingress of
17 moisture thereacross. This, however, reduces even
18 further the amount of insulation in the cavity.

19
20 To date, insulating the external face of the outer
21 leaf of the cavity wall has not been an option. To
22 employ the methods and materials used to date would
23 not be suitable for this purpose.

24
25 The application of insulation to the outer surface
26 of a cavity masonry wall would have the benefits of
27 providing better insulation standards, good weather
28 defences and a sound structure. Presently, such
29 application would be dependent on traditional
30 constructional skills and materials and would not
31 lend itself to fast methods of construction.

32

1 In general, it is anticipated that conventional
2 cavity masonry will be unable to cope with the large
3 volumes of insulation demanded by future building
4 standards. Any solutions to the problems associated
5 with the prior art must minimise the complexity of
6 sophisticated external wall composites and the range
7 of products found in wall sandwiches. Construction
8 systems are required which meet industry standards
9 and yet facilitate quick and easy erection without
10 excessive skill requirements. Moreover,
11 construction methods must be highly adaptable to
12 facilitate architectural design requirements.

13
14 In short, construction system and methods are
15 increasingly required which facilitate a high level
16 of insulation to reduce fuel consumption, prevent
17 fuel poverty, facilitate heating and which meet
18 stringent building regulations. Insulation employed
19 is generally of three main types, namely, mineral
20 fibre slabs, granular filling or plastics foam
21 slabs. The insulation material is generally placed
22 internally or within a cavity both of which have the
23 limitations and disadvantages outlined above.

24
25 It is an objection of the invention to overcome the
26 problems of the prior art.

27
28 According to the invention there is provided a
29 structural rib for a wall construction assembly,
30 comprising a web and first and second flange
31 portions, the first and second flange portions being
32 attachable to respective wall panels, the structural

1 component further comprising a first fin extending
2 from the web portion in a substantially lateral
3 direction thereto.

4

5 Preferably, the structural component has a second
6 fin extending from the web portion in a direction
7 opposite to that of the first fin.

8

9 Preferably, the first and second fins are co-planar
10 and extend from the web portion to form an angle of
11 90° with the web portion.

12

13 Optionally, the structural component has a plurality
14 of first and second fins extending from the web
15 portion, such that each pair of first and second
16 fins are co-planar and extend from opposite sides of
17 the web portion.

18

19 Preferably, the first and second fins have a free
20 end.

21

22 Preferably, the free end of the first and/or second
23 fins is adapted for complementary engagement with
24 cladding accessories, for example, insulation
25 restraining straps, bars or panels.

26

27 Preferably, the free end of the first and/or second
28 fins has a slot for receiving the cladding
29 accessories.

30

1 Preferably, the slot is adapted to resist withdrawal
2 of the cladding accessory after its insertion
3 therein.

4 Preferably, the first and second flange portions of
5 the structural component have slots in opposite
6 sides thereof for receiving cladding accessories for
7 example, insulation restraining straps, bars or
8 panels.

9
10 Preferably, an end wall of the first and/or second
11 flange portions of the structural component are
12 grooved to receive adhesive to secure the first
13 and/or second flange portions to the respective wall
14 panels. Conventional securing means can also be
15 used, for example, a nut and bolt, screw or rivet.

16
17 Typically, the structural component is made of a
18 strong, lightweight material, for example,
19 aluminium, steel, alloy or glass reinforced
20 composite. Preferably the structural component is
21 an extrusion.

22
23 According to a further aspect of the present
24 invention there is provided a wall construction
25 assembly, comprising a plurality of spaced
26 structural components, each structural component
27 comprising a web, first and second flange portions,
28 and one or more pairs of opposed first and second
29 fins extending from the web portion in a
30 substantially lateral direction thereto, the
31 assembly further comprising at least one wall panel
32 connected to one of the first and second flange

1 portions and insulation held between adjacent
2 structural components.

3

4 Preferably, the assembly has a second wall panel
5 connected to the other of the first and second
6 flange portions.

7

8 Preferably, the assembly has insulation disposed
9 between the first and second fins of the structural
10 component, and the first and/or second wall panel,
11 the insulation extending between adjacent structural
12 components.

13

14 Preferably, the first and second flange portions of
15 the structural component have slots in opposite
16 sides thereof for receiving cladding accessories for
17 example, insulation restraining straps, bars or
18 panels.

19

20 Preferably, the free end of the first and/or second
21 fins is adapted for complementary engagement with
22 cladding accessories, for example, insulation
23 restraining straps, bars or panels. In this way, the
24 restraining means can divide the insulating body
25 into compartments which can be filled with different
26 types of insulating material or can be left empty as
27 desired.

28

29 Preferably, the free end of the first and/or second
30 fins has a slot for receiving the cladding
31 accessory. The cladding accessory may be a rigid

1 strap spanning between adjacent structural
2 components.

3
4 Preferably, the slot is adapted to resist withdrawal
5 of the cladding accessory after its insertion
6 therein.

7
8 Preferably, each structural component comprises a
9 plurality of pairs of opposed first and second fins
10 extending from the web portion in a substantially
11 lateral direction thereto, arranged at a regular
12 spacing along the web. Preferably, the spacing
13 along the web between the pairs of fins is
14 substantially equal to the spacing along the web
15 between the first flange and the pair of fins
16 adjacent to the first flange. Preferably, the
17 spacing along the web between the pairs of fins is
18 substantially equal to the spacing along the web
19 between the second flange and the pair of fins
20 adjacent to the second flange.

21
22 Preferably, an end wall of the first and/or second
23 flange portions of are grooved to receive adhesive
24 to secure the first and/or second flanged portions
25 to the respective wall panels. Conventional
26 securing means can also be used, for example, nut
27 and bolt, screw or rivet.

28
29 Optionally the first and/or second wall panels can
30 comprise two or more wall panels.

31

1 Preferably, there is provided a ventilation space
2 between the first and/or second flange portions of
3 the structural component and the first and/or second
4 wall panels.

5 This ventilation space may be provided by a spacing
6 member extending between the first and/or second
7 flange portions and the first and/or second wall
8 panels.

9
10 The ventilation space may also be provided or
11 increased by removing the insulation between the
12 first and second fins and the first and/or second
13 flange portions.

14
15 The structural components, assemblies and methods of
16 the invention enjoy a number of advantages over the
17 prior art. More particularly, the invention
18 facilitates high levels of insulation, minimises
19 cold bridging, eliminates condensation risks,
20 reduces air leakage significantly, minimises fire
21 risks and results in low whole life costs.
22 Moreover, the invention provides structural
23 soundness, ease of construction, is cost efficient
24 and has an acceptable appearance for architectural
25 purposes. The invention further is easily adapted
26 for use of large volumes of insulation, is a
27 complete composite structural packages, employs
28 tough, robust materials having a rigid feel,
29 exhibits impressive acoustic performance, helps to
30 protect against adverse weather using defensive
31 cavities, is suitable for use with a wide range of
32 architectural finishes, is suitable for use for all

1 building types and sizes, facilitates rapid, dry
2 building construction, employs materials of low or
3 no combustibility and can be designed to minimise
4 air leakage.

5 An embodiment of the invention will now be
6 described, by way of example only, having regard to
7 the accompanying drawings in which:-

8

9 Fig. 1 is a cross sectional plan view of a
10 structural rib in accordance with the invention;

11

12 Fig. 2 is cross-sectional plan view of an external
13 wall construction assembly or composite in
14 accordance with the invention in which the
15 structural rib of Fig. 1 is disposed between a
16 cladding panel and a wall panel;

17

18 Fig. 3 is a cross-sectional perspective view from
19 above of the wall construction assembly of Fig. 2
20 showing the make-up of the wall panel;

21

22 Fig. 4 is an exploded view of the wall panel of
23 Figs. 2 and Fig. 3 with the slip feather joints
24 separated from the cement particle panels;

25

26 Fig. 5 is an enlarged cross-sectional view of the
27 second flange of the structural rib of Fig. 2
28 attached to the wall panel with oppositely disposed
29 mounting screws;

30

31 Fig. 6 is an enlarged cross-sectional view of the
32 second flange of the structural rib attached

1 directly to a masonry wall with a fixing and to a
2 structural steel member with a bolt, with an
3 adhesive being disposed between the rib and the
4 panel;

5

6 Fig. 7 shows the first flange of the structural rib
7 attached to a cladding panel with a tie;

8

9 Fig. 8 is an enlarged view of Fig. 7 without the
10 cladding panel and showing the insulation straps;

11

12 Fig. 9 shows the first flange of the structural rib
13 attached to a masonry wall and the second flange of
14 the structural rib attached to a wall panel with a
15 wall-tie fixing;

16

17 Fig. 10 shows use of the structural rib in a
18 conventional cavity wall made up of brick/block
19 cavity wall with the second flange rib of the
20 structural rib being attached to the wall panel with
21 a wall fixing;

22

23 Fig. 11 shows a structural rib having three pairs of
24 fins;

25

26 Fig. 12 shows a structural rib having a single pair
27 of fins;

28

29 Fig. 13 is a second embodiment of a structural rib
30 of the invention provided with a central screw
31 mounting at the apex 8 on the central web portion 2;

32

1 Fig. 14 is a cross sectional view of the structural
2 rib of Figure 13 mounted between a cladding panel
3 and a wall panel;

4
5 Fig. 15 is a enlarged cross sectional view of a
6 portion of the structural rib of Figure 13 being
7 attached to the wall panel;

8
9 Fig. 16 is a cross-sectional view of the structural
10 rib of Figure 13 attached to a masonry wall and to a
11 steel framing with an adhesive disposed between the
12 structural rib and the masonry component;

13
14 Fig. 17 is a cross-sectional view of the structural
15 rib of Figure 13 mounted at the cladding panel, and

16
17 Fig. 18 is a side cross-sectional view of the
18 structural rib of Figure 13 in use, and

19
20 Fig. 19 is a partial perspective view of the
21 assembly of Figures 13 to 18.

22
23 Referring to the drawings and initially to Fig. 1,
24 there is shown a structural rib generally indicated
25 by the reference numeral 1, having a central
26 elongate stiffening web 2 and first and second
27 generally triangular shaped flanges 4,6 respectively
28 either end of the central stiffening web 2. The
29 structural component 1 defines a longitudinal axis
30 L-L along the central web between the first flange 4
31 and the second flange portion 6. The structural rib
32 1 is symmetrical about the longitudinal axis L-L.

1 The structural rib 1 serves to form a bridge across
2 a cavity in an external wall and acts as a
3 supporting element in use.

4
5 The stiffening web 2 has two pairs of mounting fins
6 48, which extend laterally from the stiffening web
7 in opposite directions perpendicular to the
8 longitudinal axis L-L of the structural component 1.
9 Each pair of fins 48 are contiguous through the
10 stiffening web 2 and are spaced apart from each
11 other along the stiffening web 2. Each fin 48 is in
12 the shape of a rod having a two pronged-fork end
13 portion 50. Each prong 52,54 of the forked end
14 portions 50 have grooves 56,58 on its inner faces
15 for receiving clip-in attachments.

16
17 The flanges 4 and 6 have apices 8 and 10, side walls
18 12,14 and 16,18 and bases 20 and 22 respectively.
19 The web 2 extends through the apices 8 and 10 to
20 meet the bases 20 and 22 of each triangular flange 4
21 and 6, respectively, such that the longitudinal axis
22 L-L bisects each triangular flange 4 and 6.

23
24 The side walls 12,14 of the first flange 4 gradually
25 curve to meet the base 20 at areas of contact A and
26 B defined by a thickening of the side walls 12,14
27 generally midway along their length. Both side
28 walls 12,14 and the base 20 continue to extend
29 beyond their area of contact A and B parallel to
30 each other, spaced apart and perpendicular to the
31 longitudinal axis L-L to define slots 24,26

1 therebetween. The slots 24,26 have grooves 28,30 in
2 the side walls 12,14 also for receiving clip-in
3 attachments. The free ends of the base 20 are
4 shaped back on themselves away from the web portion
5 2 so that they face each other forming U-shaped
6 sections 32 and 34. A channel 112 is defined between
7 the free ends of the base 20 for receiving a spacing
8 block 108 as discussed further below.

9
10 The second flange 6 is similar in shape to the first
11 flange 4. However, the free ends of the base 22 are
12 not shaped back on each other to form U-shaped
13 sections, but rather extend a distance beyond the
14 free ends of the side walls 16,18 parallel thereto
15 and perpendicular to the longitudinal axis L-L to
16 define further slots 36,38 for receiving between the
17 side walls 16, 18 and base 22. As previously
18 described, the slots 36,38 have grooves 40,42 in the
19 side walls 16,18 to facilitate the clip-in
20 attachment.

21
22 The base 22 of the flange 6 also has recesses 44
23 along a portion of the length of its side remote
24 from the web 2. In all other respects, the flange
25 portions 4 and 6 are identical.

26
27 Referring now to Fig. 2, there is shown a section of
28 a wall construction assembly of the invention
29 generally indicated by the reference numeral 100,
30 which shows the position and function of the
31 structural rib 1 in the external wall construction
32 made up of a wall panel 102 and a cladding panel 110

1 spaced apart from the wall panel 102 to define a
2 cavity 114 for receiving insulation therebetween.

3

4 The second flange 6 is attached with screws to the
5 wall panel 102 which is described in more detail
6 below. Insulation restraining straps 104 are
7 clipped into the slots 24,26 of the first flange
8 portion 4. The straps 104 have formations
9 thereon(not shown) which engage with the grooves
10 28,30 to resist withdrawal of the straps therefrom.
11 Insulating material 106, indicated by the shading
12 portion in Fig. 2, is placed within the space formed
13 between the wall panel 102 and the straps 104. The
14 spacing block 108 is mounted in the channel 112 and
15 is also fixed to the cladding panel 110. The
16 spacing block 108 provides for a ventilation space
17 116 between the insulating material 106 and the
18 cladding panel 110.

19

20 Although Fig. 2 only shows a single structural rib 1
21 in the wall construction assembly 100, it will be
22 appreciated that a number of these components, as
23 required, can be placed along the length of the wall
24 panels 102, 110.

25

26 The structural rib 1 is formed from a strong
27 material, such as, for example, aluminium or steel.
28 Owing to the shape of the structural rib 1, no
29 further support is necessary to maintain the
30 structural integrity of the wall construction
31 assembly 100. The broad profile of the first and
32 second flanges 4,6 add stiffness and strength to the

1 structural rib 1, the web 2 adding longitudinal
2 stiffness and strength, and the fins 48 adding
3 lateral stiffness, strength and overall structural
4 integrity to the wall construction assembly 100.

5
6 In use, the wall construction assembly 100 is
7 capable of providing insulation to any required
8 standard, can be placed about the internal or
9 external walls of a building structure as desired
10 and can be attached to the walls in any conventional
11 manner. However, due to the strength of the
12 structural component 1, the wall construction
13 assembly 100 is structurally very sound and does not
14 need the support of the wall of the building
15 structure and as such does not need to be attached
16 thereto. In short, the wall construction assembly of
17 the invention can serve as a standalone structure or
18 can be used in combination with existing structures.

19
20 Fig. 3 shows the structural rib 1 located between
21 the cladding panel 110 and the wall panel 102. As
22 shown in the drawing, the structural rib 1 is
23 adapted to secure insulation 106 between the
24 cladding panel 110 and the wall panel 102.

25
26 The wall panel 102 for use in the wall construction
27 assembly 100 of the invention is made up of a
28 composite of individual horizontal panels 118 having
29 channels 120 at the periphery thereof for receiving
30 slip feather joint 122 therein to interconnect the
31 panels 118. The panels 118 of the wall panel 102
32 are typically formed from cement particle panels

1 having a thickness of approximately 25 mm while the
2 slip feather joints 122 are dimensions to be
3 received within the channels 120. As shown in
4 Figures 3 and 4, the panels 118 and the slip feather
5 joints 122 are interconnected to assemble the wall
6 panel 102.

7
8 As shown in Figure 5, the flange 6 of the rib 1 is
9 attached to the wall panel 102 by a machine driven
10 screw 124 inserted through the base 22 to initially
11 produce a tight interface between the rib and the
12 wall panel 1 to prevent jacking off. Subsequently,
13 a primary screw 126 which is the primary structural
14 fixing is inserted through the wall panel 102 into
15 the base 22 to secure the rib to the wall panel 102.

16
17 As shown in Figure 6, the rib 1 can also be secured
18 to a masonry wall 128 by a proprietary fixing such
19 as a bolt-type fixing 130. Additional bond strength
20 can be achieved by locating an adhesive such as an
21 epoxy mastics 132 between the base 22 and the
22 masonry wall 128. The adhesive 132 is received
23 within the recesses 44.

24
25 Alternatively, where the rib 1 is to be secured to a
26 steel framing starter angle or the like, a
27 conventional bolt 132 can be employed.

28
29 It will be appreciated from the foregoing that the
30 amount of insulation is not limited by the cavity
31 114 of the building structure. As insulation can
32 now be added externally of the walls of the building

1 structure, the thickness of the insulation added is
2 not limited. Different sized structural ribs 1 can
3 be used for this purpose as shown in Figures 11 and
4 12. Where a thicker wall construction assembly 100
5 is employed it may be prudent to use a greater
6 number of structural ribs 1 to ensure that the wall
7 construction assembly 100 is structurally stable.

8
9 It will be also be appreciated that various
10 different embodiments of the wall construction
11 assembly 100 may result from the present invention
12 and that the structural rib 1 can be used in a
13 number of ways. For example, in an alternative
14 embodiment of wall construction assembly 100, the
15 cladding panel 110 may be connected directly to the
16 first flange 4. Ventilation space may be provided
17 by placing the insulation restraining members 104
18 between the forked end portions 50 of the fins 48.

19
20 It will further be appreciated that the first flange
21 4 may be attached to the panel 110 in a number of
22 different ways, a typical example being shown in
23 Fig. 7 where one end of a suitably shaped tie 120
24 engages the u-shaped sections 24,26 of the first end
25 portion 4, the other end of the tie 120 being fixed
26 to the panel 110.

27
28 It will be appreciated that the structural component
29 1 is also suitable for using in a conventional
30 cavity wall 134. This is shown most clearly in
31 Figure 10. Due to the structural stiffness and
32 strength of the structural component 1, the distance

1 between the inner leaf 136 and outer leaf 138 of the
2 cavity wall may be greater than conventional
3 spacing, allowing an increased amount of insulation
4 to be placed there between. The rib 1 can be
5 secured to the outer leaf 138 by a conventional
6 wall-tie head 140. As shown in Figure 9, the rib 1
7 can also be employed in a wall construction made up
8 of an outer leaf 138 and an inner wall panel 102 as
9 previously described.

10

11 Figures 13 to 19 show a second embodiment of a
12 structural rib 1 and a corresponding structural wall
13 assembly 100 in accordance with the invention.

14

15 As shown in the drawings, the structural rib 1 is
16 broadly similar to the structural rib 1 described in
17 figures 1 to 12 and, accordingly, like numerals
18 indicate like parts. However, in the present
19 embodiment, the flanges 4, 6 have a more rigid head
20 profile. More particularly, the flanges 4, 6 are
21 substantially U shaped in cross-section having a
22 central bore 142 disposed about the longitudinal
23 axis L-L for receiving a screw slot fixing 144 for
24 securing the rib 1 to a cladding panel 110 or a wall
25 panel 102. As shown in the drawings, the rib 1 is
26 located between a cladding panel 110 and a wall
27 panel 102 as previously described. However, in the
28 present embodiment, a continuous primary fixing rail
29 146 is attached to the structural rib 1 at the
30 flange 4 which is held in place by the fixing 144.
31 The continuous primary fixing rail 146 supports an
32 outer layer of dense insulation such as ROCKWOOL 148

1 between the structural rib 1 and the spacing block
2 108. Accordingly, in the present embodiment an
3 additional layer of insulation is provided
4 externally of the structural rib 1. The additional
5 insulation layer typically has a minimum thickness
6 of 30 mm and is supported on the rail 146 which also
7 serves to provide mountings for the cladding panel
8 110 as shown in figures 18 and 19.

9
10 As previously described, the structural rib 1
11 therefore facilitates the assembly of wall panels in
12 a wall structure assembly and also provides load
13 bearing strength for insulation and panels alike.

14
15 As shown in Figure 15, the flange 6 is secured to
16 the wall panel 102 as previously described employing
17 a machine driven screw 124 and a structural screw
18 126.

19
20 As shown in Figure 17, the spacing block 108 is
21 secured to the rail 146 by a screw such as a
22 stainless self drill/self tapping screw 150.

23
24 Figures 18 and 19 clearly demonstrate the structure
25 of the wall assembly 106 of the second embodiment.
26 As shown in the drawings, the assembly is further
27 provided with a thermo-break packer 152 between the
28 structure rib 1 and the rail 146.